

FORM PTO-1390 (Modified)
(REV 10-95)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

1712

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/890494

INTERNATIONAL APPLICATION NO.
PCT/DE 00/04028

INTERNATIONAL FILING DATE
NOVEMBER 15, 2000

PRIORITY DATE CLAIMED
DECEMBER 4, 1999

TITLE OF INVENTION

ELECTRICAL MACHINE

APPLICANT(S) FOR DO/EO/US

Horst BRAUN, Hans-Joachim LUTZ, Dieter WILLMS, Jerome DEBARD, Anne PERRIN-BONNET

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

ET364096678 US

U.S. APPLICATION NO. IF KNOWN, SEE 37 CFR 09/890494	INTERNATIONAL APPLICATION NO. PCT/DE 00/04028	ATTORNEY'S DOCKET NUMBER 1712
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20. The following fees are submitted:
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

☐ Search Report has been prepared by the EPO or JPO **\$930.00**

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) **\$720.00**

☐ No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **\$790.00**

☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO **\$1,070.00**

☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **\$98.00**

CALCULATIONS PTO USE ONLY	

ENTER APPROPRIATE BASIC FEE AMOUNT = **\$1,000.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)). **\$0.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	8 - 20 =	0	x \$18.00	\$0.00
Independent claims	1 - 3 =	0	x \$80.00	\$0.00
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00

TOTAL OF ABOVE CALCULATIONS = \$1,000.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). ☐ **\$0.00**

SUBTOTAL = \$1,000.00

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). **\$0.00**

TOTAL NATIONAL FEE = \$1,000.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐ **\$0.00**

TOTAL FEES ENCLOSED = \$1,000.00


	Amount to be: refunded	\$
	charged	\$

- ☐ A check in the amount of _____ to cover the above fees is enclosed.
- ☒ Please charge my Deposit Account No. **19-4675** in the amount of **\$1,000.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STRIKER, STRIKER & STENBY
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SIGNATURE
MICHAEL J. STRIKER
NAME
27233
REGISTRATION NUMBER
JULY 31, 2001
DATE

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Attorney Docket # 1712

For : ELECTRICAL MACHINE

July 31, 2001


S I R S:

In the Claims:

Substitute the claims attached hereto.

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,


Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

FOI b6 b7C

Claims

1. An electrical machine having a rotor (10), in particular a claw pole rotor, having an exciter system of electrically excited individual poles in the rotor (10) in the form of electromagnetically excited poles (28) and counterpart poles (34), having a pole gap closure (55), inserted between the poles (28) and counterpart poles (34) that alternate on the circumference of the rotor (10), which at least partly fills the open spaces, characterized in that the pole gap closure (55) is braced by at least one of its axial end regions, via projections (64), on pole roots (31, 37).

2. The electrical machine of claim 1, characterized in that the pole gap closure (55) in the region of the projections (64) has recesses (67) into which the projections (64) are fitted, so that surfaces oriented outward of the pole gap closure (55), poles (28) and counterpart poles (34) result in an essentially cylindrical surface of the rotor (10).

3. The electrical machine of claim 2, characterized in that the projections (64) are fabricated by a reshaping process of the pole wheels (13, 16).

4. The electrical machine of [one of the foregoing claims] claim 1, characterized in that between at least one end region of the pole gap closure (55) and at least one throat (79) between two pole roots (31; 37), an opening to a chamber radially inside the poles (28) and counterpart poles (34) is recessed out.

5. The electrical machine of [one of the foregoing claims]

Claims

1. An electrical machine having a rotor (10), in particular a claw pole rotor, having an exciter system of electrically excited individual poles in the rotor (10) in the form of electromagnetically excited poles (28) and counterpart poles (34), having a pole gap closure (55), inserted between the poles (28) and counterpart poles (34) that alternate on the circumference of the rotor (10), which at least partly fills the open spaces, characterized in that the pole gap closure (55) is braced by at least one of its axial end regions, via projections (64), on pole roots (31, 37).

2. The electrical machine of claim 1, characterized in that the pole gap closure (55) in the region of the projections (64) has recesses (67) into which the projections (64) are fitted, so that surfaces oriented outward of the pole gap closure (55), poles (28) and counterpart poles (34) result in an essentially cylindrical surface of the rotor (10).

3. The electrical machine of claim 2, characterized in that the projections (64) are fabricated by a reshaping process of the pole wheels (13, 16).

4. The electrical machine of claim 1, characterized in that between at least one end region of the pole gap closure (55) and at least one throat (79) between two pole roots (31; 37), an opening to a chamber radially inside the poles (28) and counterpart poles (34) is recessed out.

5. The electrical machine of claim 1, characterized in

that a transition between the surfaces of the pole gap closures (55) and the poles (28) and counterpart poles (34) is effected in infinitely graduated fashion.

5 6. The electrical machine of claim 1, characterized in that the pole gap closure (55) has bar-shaped regions (70), which are joined to one another by a ring (37).

10 7. The electrical machine of claim 6, characterized in that at least one end region (61) is joined to the ring (73) by a face element (76).

15 8. The electrical machine of claim 7, characterized in that at least one face element (76) is braced on a radially inward-oriented underside of a pole (28) or counterpart pole (34).

TOP SECRET - FRODO BAGGINS

ELECTRICAL MACHINE

Prior Art

The invention relates to an electrical machine, in particular a claw pole generator for motor vehicles, as generically defined by the preamble to the independent claim.

Electrical machines for motor vehicles are known from European Patent EP 0 720 275, for instance. The known electrical machine includes a rotor of the claw pole type, which comprises among other elements a shaft, two pole wheels, an exciter coil, and a pole closure. The pole closure is embodied such that it closes the interstices of the claw poles of opposite polarity; that no flow is detached on the radially outer, approximately axially oriented edges of the poles and thus prevents the attendant noise production. The claw closure is also embodied such that a substantial portion of its centrifugally acting intrinsic load is transmitted to the claw pole tips via the inside of these tips.

This known electrical machine has the disadvantage, among others, that by the absorption of the centrifugal load of the claw closure via the claw poles, an additional load is exerted on the claw poles in addition to their intrinsic load.

Advantages of the Invention

With the electrical machine of the invention as defined by the characteristics of the independent claim, it is possible to transmit the intrinsic centrifugal load of the

claw closure to the pole wheels in such a way that the poles and counterpart or opposite poles are not loaded. To that end, it is provided that the pole closure is braced by at least one of its axial end regions, via projections, on the pole roots.

By the provisions recited in the dependent claims, advantageous refinements of and improvements to the characteristics disclosed in the independent claim are obtained.

In the region of the axial end regions, the pole closure has recesses, into which the projections of the pole roots are fitted. This has the advantage that an essentially cylindrical surface of the rotor is thus obtained.

Because the pole wheels are produced by a reshaping process, it is advantageous if the projections are likewise fabricated by reshaping.

In a further feature of the invention, between at least one end region of the pole closure and at least one throat between two pole roots, an opening remains recessed out toward a space radially inside the poles and counterpart poles. This recessing makes a better inflow of an impregnating resin for fixing the exciter coil possible.

So that the air flow will not detach at the transition from the outward-oriented surfaces of the poles and counterpart poles to the pole closure, the transition between the surfaces and counterpart poles of the pole closure and the poles and counterpart poles must be effected in infinitely graduated fashion.

To obtain better intrinsic stiffness of the pole closure, the closure regions of the pole closure are joined together by a ring. A further improvement in the pole closure is obtained by providing that a region between the ring and an end region of the pole closure is closed by a face element.

So that the pole closure between two projections at the pole roots will not be subjected to overly severe bending stress, the face element in a further feature of the invention should be braced on a radially inward-oriented underside of a pole or counterpart pole.

Drawings

The invention will be described in further detail below in terms of an exemplary embodiment in conjunction with the associated drawings. Shown are:

Fig. 1, a perspective view of a rotor of an electrical machine of the invention;

Fig. 2, an axial view of a pole wheel;

Fig. 3, a side view of a claw closure of the invention;

and

Fig. 4, an end view on the rotor with the pole closure.

Description of the Exemplary Embodiments

Identical components or those functioning the same as each other are identified by the same reference numerals.

Fig. 1 shows the exemplary embodiment of a rotor 10 of the electrical machine of the invention. The rotor 10 is shown as a rotor of the claw pole type. The rotor has a pole wheel 13 and a counterpart pole wheel 16, both of which are secured to a rotor shaft 19. The pole wheel 13 and the counterpart pole wheel 16 are spaced apart by a rotor core 22. The pole wheel 13 comprises a pole wheel disk 25, at which the poles 28 originate. The poles 28 extend essentially in the axial direction of the rotor shaft 19. The poles 28 are integrally joined to the pole wheel 13 or pole wheel disk 25 via pole roots 31.

The design of the counterpart pole wheel 16 is the same as the design of the pole wheel 13. Counterpart poles 34 are integrally joined to the counterpart pole wheel disk 40 via counterpart pole roots 37. The pole roots 31 and counterpart pole roots 37 are the non-self-supported regions between the poles 28 and counterpart poles 34, respectively, and the pole wheel disk 25 and counterpart pole wheel disk 37. The counterpart poles 34 extend, like the poles 28, in the axial direction of the rotor shaft 19.

The individual poles 28 are spaced uniformly apart on the circumference of the rotor 10 and have pole gaps between individual poles 28. The counterpart poles 34 of the counterpart pole wheel 16 are likewise spaced apart uniformly on the circumference and form counterpart pole gaps. In the installed position, the pole wheel 13 and the counterpart pole wheel 16 are disposed such that the poles 28 of the pole wheel 13 protrude into the counterpart pole gaps of the counterpart pole wheel 16. Conversely, the counterpart poles 34 of the counterpart pole wheel 16 extend into the pole gaps of the pole wheel 13. The counterpart poles 34 and the poles 28 are furthermore also disposed with uniform spacing from

one another. The poles 28 and counterpart poles 34 embrace an exciter coil 49, which is disposed in the axial direction between the pole wheel disk 25 and the counterpart pole wheel disk 40, on the one hand, and on the other in the radial direction between the rotor core 22 and the poles 28 and counterpart poles 34.

The aerodynamic properties of such a rotor 10 are poor, without a pole closure. The rotating rotor 10 and the numerous interstices or so-called pole gaps 52 experience a flow around them of by cooling air in operation. These pole gaps enable the air flowing around them to detach at the axial edges, disposed in the axial direction, of the poles 28 and counterpart poles 34. This develops an unordered flow, which is a cause of noise emissions of a rotor or generator.

By inserting a pole gap closure 55 into the pole gaps 52, it is no longer possible for a noise-generating flow to detach at the edges 58, extending approximately axially, of the poles 28 and counterpart poles 34. The pole gap closure 55 is braced with at least one of its axial end regions 61 via projections 64 on the pole roots 31 or counterpart pole roots 37; see also Fig. 2. The pole gap closure is braced on the counterpart pole roots 37 or pole roots 31. This means that the radially outward-acting centrifugal load originating at the pole gap closure 55 is conducted not via the counterpart poles 34 or poles 28 to the pole wheel 13 but rather via the projections 64 on the counterpart pole roots 37 and pole roots 31 to the pole wheel 13 or 16, respectively, without moment action. This means a considerable reduction in the load on the poles 28 or 34 and their counterpart poles 37 and pole roots 31, respectively, since this reduces the bending load of the counterpart pole roots 37 and pole roots 31.

To obtain a surface of the rotor 10 that is as unfissured as possible, the pole gap closure 55, in the region of the projections 64, has recesses 67 into which the projections 64 are fitted. The result is a substantially cylindrical surface of the rotor 10 comprising the outward-oriented surfaces of the pole gap closure 55, counterpart poles 34 and poles 28; see also Fig. 1 and Fig. 3.

The projections 64 are formed onto the pole wheel 13 and counterpart pole wheel 16 by means of a reshaping process. Alternatively, it is also possible to produce the projections 64 by metal-cutting machining of the pole roots 31 and counterpart pole roots 37.

The pole gap closure 55 shown in Fig. 3 has the end regions 61, already mentioned, which are joined to one another by means of bar-shaped regions 70. The bar-shaped regions 70 are adapted to the outer contour of the poles 28 and counterpart poles 34, as applicable. The stability of the pole gap closure 55 is enhanced because the bar-shaped regions 70 are joined together, on their radially inward-oriented side, by a ring 73. Still further enhancement of the stability of the pole gap closure 55 is obtained by providing that the end regions 61 are each joined to the ring 73 by a respective face element 76.

From the perspective view of the rotor 10 shown in Fig. 4, an installed position of the pole gap closure 55 can be seen. The end region 61 extends between two pole roots 31. The end region 61 has a relatively short radial length, so that between the end region 61 of the pole gap closure 55 and at least one throat 79 between two pole roots 31, an opening to a chamber radially inside the poles 28 and counterpart poles 34 is recessed out. The poles 28 and the counterpart

poles 34 have so-called pole protrusions 82 and 85,
respectively, as a result of which a transition between the
radially outward-oriented surfaces of the pole gap closure 55
and the poles 28 and counterpart poles 34 is embodied in
5 infinitely graduated fashion.

In a further exemplary embodiment, the pole gap closure
55 is braced not only on projections 64 on the counterpart
pole roots 31 and pole roots 37 but furthermore on a radially
inward-oriented underside of the pole 28 and counterpart pole
10 34, respectively, as well.

Claims

1. An electrical machine having a rotor (10), in particular a claw pole rotor, having an exciter system of electrically excited individual poles in the rotor (10) in the form of electromagnetically excited poles (28) and counterpart poles (34), having a pole gap closure (55),
5 inserted between the poles (28) and counterpart poles (34) that alternate on the circumference of the rotor (10), which at least partly fills the open spaces, characterized in that the pole gap closure (55) is braced by at least one of its axial end regions, via projections (64), on pole roots (31, 37).

2. The electrical machine of claim 1, characterized in that the pole gap closure (55) in the region of the projections (64) has recesses (67) into which the projections (64) are fitted, so that surfaces oriented outward of the pole gap closure (55), poles (28) and counterpart poles (34)
5 result in an essentially cylindrical surface of the rotor (10).

3. The electrical machine of claim 2, characterized in that the projections (64) are fabricated by a reshaping process of the pole wheels (13, 16).

4. The electrical machine of one of the foregoing claims, characterized in that between at least one end region of the pole gap closure (55) and at least one throat (79) between two pole roots (31; 37), an opening to a chamber
5 radially inside the poles (28) and counterpart poles (34) is recessed out.

5. The electrical machine of one of the foregoing claims, characterized in that a transition between the surfaces of the pole gap closures (55) and the poles (28) and counterpart poles (34) is effected in infinitely graduated fashion.

6. The electrical machine of one of the foregoing claims, characterized in that the pole gap closure (55) has bar-shaped regions (70), which are joined to one another by a ring (37).

7. The electrical machine of claim 6, characterized in that at least one end region (61) is joined to the ring (73) by a face element (76).

8. The electrical machine of claim 7, characterized in that at least one face element (76) is braced on a radially inward-oriented underside of a pole (28) or counterpart pole (34).

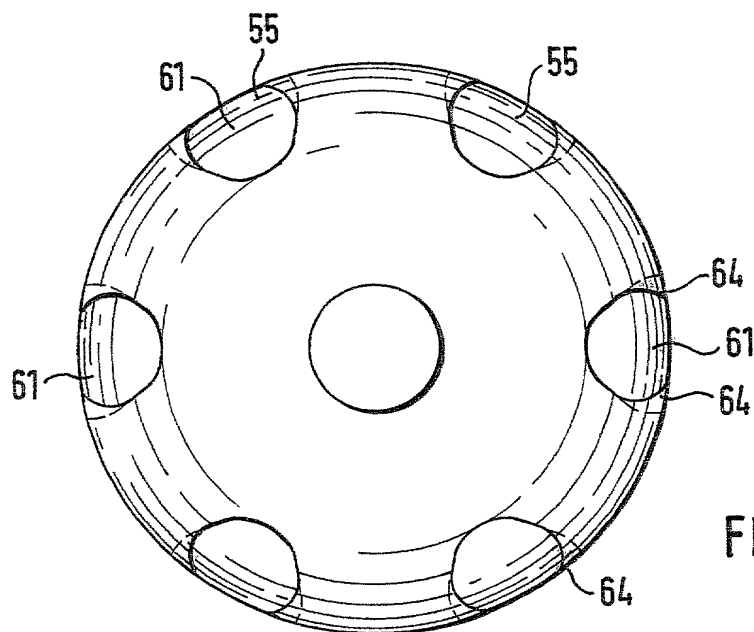
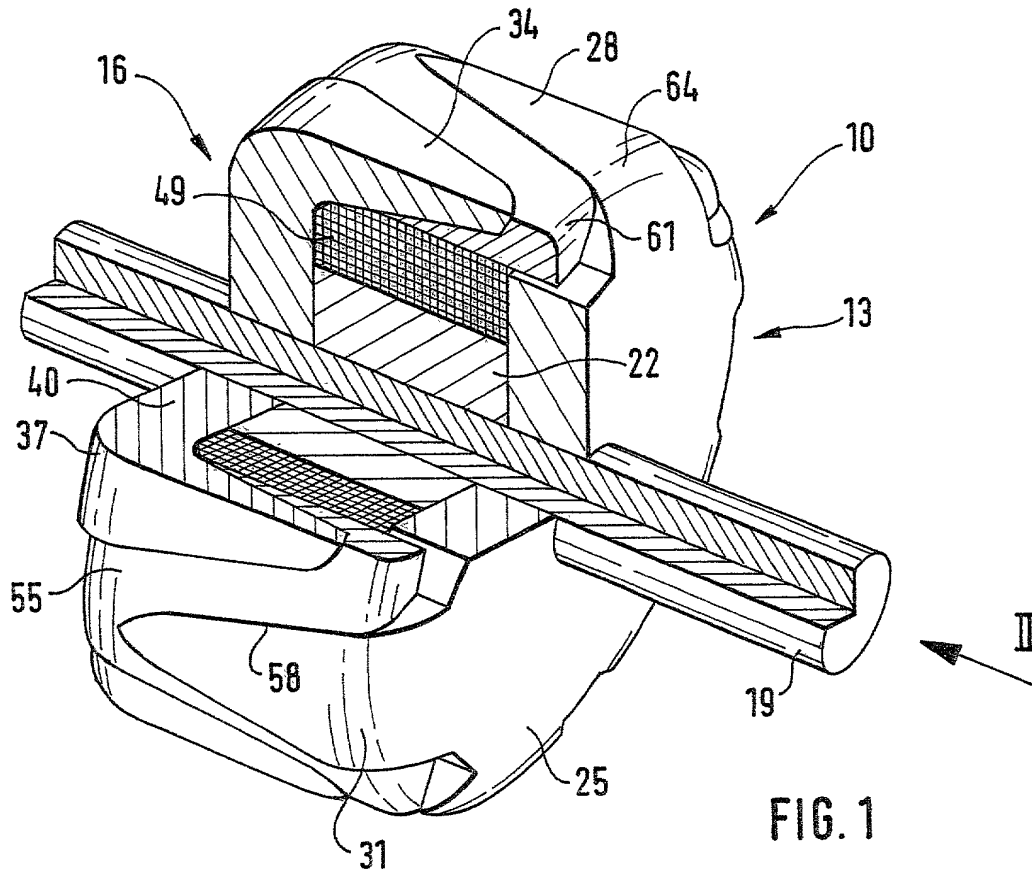


FIG. 2

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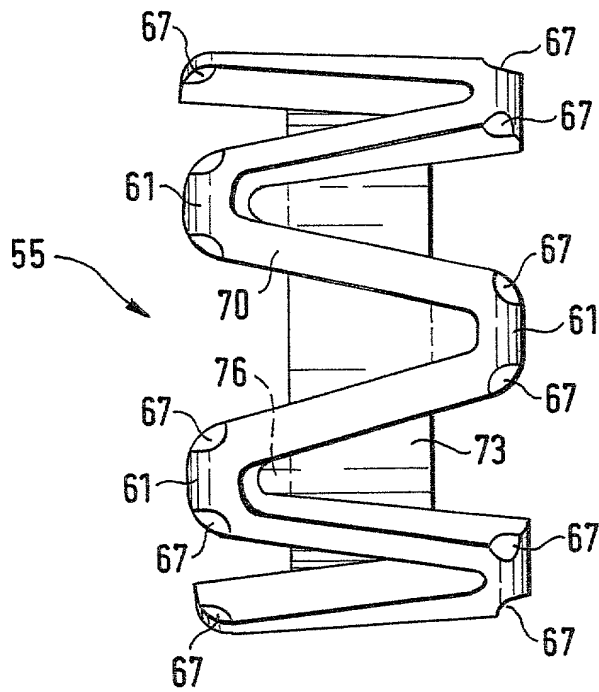


FIG. 3

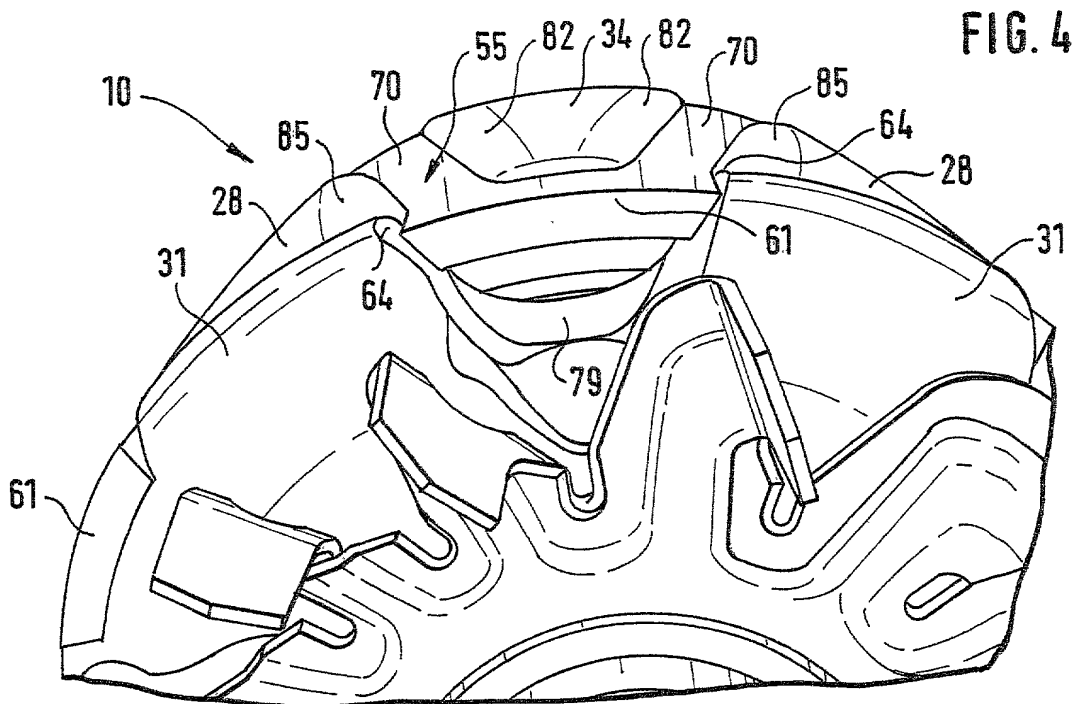


FIG. 4

R 37093

DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Horst BRAUN
Hans-Joachim LUTZ
Dieter WILLMS

Jérôme DEBARD
Anne PERRIN-BONNET

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **ELECTRICAL MACHINE** the specification of which was filed as PCT International Application number PCT/DE 00/04028 on November 15, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):

Priority claimed:

199 58 503.2
(Number)

(Number)

GERMANY
(Country)

(Country)

DECEMBER 4, 1999
(Date filed)

(Date filed)

<u>X</u>	
Yes	No
Yes	No

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

①

Michael J. Striker, Reg. No. 27233


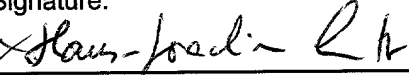
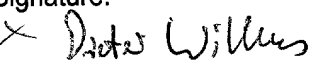


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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement

Patent 4006660

may jeopardize the validity of the application or any patent issued thereon.

1-00	Signature: 	Date: 24.7.01	Residence and Full Postal Address: Happoldstrasse 57B 70469 Stuttgart Germany DEX
	Full Name of First or Sole Inventor: Horst BRAUN	Citizenship: GERMAN	
2-00	Signature: 	Date: x 25.07.01	Residence and Full Postal Address: Ringstrasse 9 68623 Lampertheim Germany DEX
	Full Name of Second Inventor: Hans-Joachim LUTZ	Citizenship: GERMAN	
3-00	Signature: 	Date: x 26.07.01	Residence and Full Postal Address: Martin-Luther-Strasse 5 74074 Heilbronn Germany DEX
	Full Name of Third Inventor: Dieter WILLMS	Citizenship: GERMAN	
4-00	Signature: 	Date: x 06.08.01	Residence and Full Postal Address: 45. Daisy Street Cardiff CF5 1EP Great Britain GBN
	Full Name of Fourth Inventor: Jérôme DEBARD	Citizenship: BRITISH	
5-00	Signature: 	Date: x 31.07.01	Residence and Full Postal Address: 21, Birch Crescent Llantwit Fardre CF 38 2NZ Great Britain GBN
	Full Name of Fifth Inventor: Anne PERRIN-BONNET	Citizenship: FRENCH	
	Signature:	Date:	Residence and Full Postal Address:
	Full Name of Sixth Inventor:	Citizenship:	
	Signature:	Date:	Residence and Full Postal Address:
	Full Name of Seventh Inventor:	Citizenship:	
	Signature:	Date:	Residence and Full Postal Address:
	Full Name of Eighth Inventor:	Citizenship:	